UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/649,436	08/26/2003	Hung-Jen Hsu	252011-1610	5190

47390 7590 08/10/2005

THOMAS, KAYDEN, HOSTEMEYER & RISLEY LLP
100 GALLERIA PARKWAY
SUITE 1750
ATLANTA, GA 30339

EXAMINER	
WILLIAMS, DON J	
ART UNIT	**PAPER NUMBER**
2878	

DATE MAILED: 08/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/649,436	HSU ET AL.
	Examiner	Art Unit
	Don Williams	2878

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 August 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on *08/26/2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the Applicant's application filed on August 26, 2003.

Drawings Objections

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Claim 5, lines 2-5 with respect to fig. 5 objected to, "the 5-50% reduced size microlenses in the center region" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 7-9, 11-14,18-22, 24-26 are rejected under 35 USC 102(b) as being anticipated by Endo et al (6,255,640).

As to claim 1, Endo et al disclose a chip (12) having a plurality of sensing areas being capable of receiving incident radiation (L) and a stacked transmission layer (16), (18), (19), (21), and (22) covering the sensing areas; and a plurality of microlens (27) covering the stacked transmission layer (16), (18), (19), (21), and (22), the size (F) of each microlens (27) being a function of the distance (2.5μm) to (3.0μm) between the microlens (27) to a chip center (12), (see fig. 2, column 2, lines 21-30, fig. 3, column 6, lines 27-35, fig. 11, column 7, lines 1-15).

As to claim 2, Endo et al disclose the sizes (F) of the microlens (117) are altered based on the distance (2.5μm) to (3.0μm) between the microlens (117) to the chip center (12) allowing uniformed photoenergies (L) to be received by the sensing areas of the chips (12), (see fig. 1, column 2, lines 42-65, fig. 3, column 6, lines 30-65, fig. 11, column 7, lines 1-15).

As to claim 3, Endo et al disclose the size (F) of each microlens (27) increases as the distance (2.5μm) to (3.0μm) from the microlens (27) to the chip center (12) increases, (see fig. 1, column 2, lines 42-65, fig. 11. column 7, lines 1-15).

As to claim 7, Endo et al disclose the sizes (F) of the microlenses (27) are progressively increasing from the chip center (12) to a chip edge (12) to maintain balanced of brightness (L) in different regions, (see fig. 3, column 6, lines 29-64, fig. 11, column 7, lines 1-15).

As to claim 8, Endo et al disclose variation of microlenses sizes (F) disposed in the chip center (12) and in the chip edge (12) is 5-50% (see fig. 11, column 7, lines 1-15).

As to claim 9, Endo et al disclose the difference between the sizes (F) of the microlenses (27) disposed in the chip center (12) and in the chip edge (12) is about 20%, (see fig. 11, column 7, lines 1-15).

As to claim 11, Endo et al disclose an image sensor (12) embedded into the semiconductor substrate (11), (see fig. 3, column 5, lines 5-15).

As to claim 12, Endo et al disclose a chip (12) having a plurality of sensing areas capable of receiving incident radiation (L); a plurality of color filters units (24) corresponding to each sensing area and disposed overlying the sensing areas; and a plurality of microlenses (27) overlying the color filter units (24), the distance (2.5μm) to (3.0μm) between center of the microlens (27) and a center of the corresponding sensing area being a function of the distance between the corresponding sensing area to a chip center (12), each microlens (27) overlying its corresponding color filter unit (24) without overlying adjacent regions, (see fig. 3, column 6, lines 27-43).

As to claim 13, Endo et al disclose the distance (2.5μm) to (3.0μm) between the microlens center (27) to the corresponding sensing area center is shifted based on the

distance between the corresponding sensing area to a chip center (12) allowing uniformed photoenergies (L) to be received by the sensing areas of the chips (12), (fig. 10, column 6, lines 50-57).

As to claim 14, Endo et al teach the distance (2.5μ) to (3.0μm) between the center of the microlens (27) and the center of the corresponding sensing area increases as the distance between the corresponding sensing areas to the chip center (12) increases projecting a balanced uniformed brightness improving pixel quality, (see fig. 3, column 6, lines 27-42, fig.10, column 6, lines 50-57).

As to claim 18, Endo et al disclose and IC transparent stacked layer (21) between the sensing areas and the color filter units (24), (see fig. 3, column 5, lines 5-65).

As to claim 19, Endo et al disclose an image sensor (12) embedded into the semiconductor substrate (11), (see fig. 3, column 5, lines 5-15).

As to claim 20, Endo et al disclose a semiconductor substrate (11); a plurality of sensing areas capable of receiving incident radiation (L) formed in the semiconductor substrate (11); a plurality of color filters units (24) corresponding to each sensing area and disposed overlying the sensing areas; and a plurality of microlenses (27) overlying the color filter units (24), the distance (2.5μm) to (3.0μm) between center of the microlens (27) and a center of the corresponding sensing area being a function of the distance between the corresponding sensing area to a chip center (12), each microlens (27) overlying its corresponding color filter units (24) without overlying adjacent regions, (see fig. 3, column 6, lines 27-43).

As to claim 21, Endo et al disclose distance (2.5μm) to (3.0μm) between the center of each microlens (27) and the center of the corresponding sensing area is shifted based on the distance between the corresponding sensing area to a chip center (12) to project converged photoenergies, (see fig. 10, column 6, lines 50-57).

As to claim 22, Endo et al disclose distance (2.5μm) to (3.0μm) between the center of the microlens (27) and the center of the corresponding sensing area increases as the distance between the corresponding sensing areas to the chip center (12) increases, (fig. 3, column 6, lines 27-43, fig. 10, column 6, lines 50-57).

As to claim 24, Endo et al disclose a semiconductor substrate (11) a plurality of sensing areas being capable of receiving incident radiation (L) and a stacked transmission layer (16), (18), (19), (21), and (22) covering the sensing areas; and a plurality of microlens (27) covering the stacked transmission layer (16), (18), (19), (21), and (22), the size (F) of each microlens (27) being a function of the distance (2.5μm) to (3.0μm) between the microlens (27) to a chip center (12), (see fig. 2, column 2, lines 21-30, fig. 3, column 6, lines 27-35, fig. 11, column 7, lines 1-15).

As to claim 25, Endo et al disclose the sizes (F) of the microlens (117) are altered based on the distance (2.5μm) to (3.0μm) between the microlens (117) to the chip center (12) allowing uniformed photoenergies (L) to be received by the sensing areas of the chips (12), (see fig. 1, column 2, lines 42-65, fig. 3, column 6, lines 30-65, fig. 11, column 7, lines 1-15).

As to claim 26, Endo et al disclose the size (F) of each microlens (27) increases as the distance (2.5μm) to (3.0μm) from the microlens (27) to the chip center (12) increases, (see fig. 1, column 2, lines 42-65, fig. 11. column 7, lines 1-15).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 4-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Endo et al in view of Yamamoto et al (6,638,786).

As to claim 4, Endo et al disclose microlenses (27) disposed at the edge region, (see fig. 15). Endo et al fail to teach microlenses at the edge region are kept at an original size. Yamamoto et al disclose microlenses at the edge region are kept at an original size.

It would have been obvious for one ordinary skill in the art to modify Endo et al to include taller uniformed microlenses at the edge region as disclosed by Yamamoto et al to capture light incident at an angle to improve an even projection or scattering of optical light on the imaging areas of the chips embedded in the semiconductor substrate of the imaging sensor device and to improve pixel quality, (see fig. 4, column 3, lines 21-67).

As to claim 5, Endo et al fail to teach microlenses sizes located in the center region are reduced by 5-50%. Yamamoto et al disclose microlenses (403) located in the

center region are (1-2) microns shorter compared to microlenses (401) located in the edge region (1-4) microns taller.

It would have been obvious for one ordinary skill in the art to modify Endo et al to include reduced microlenses in the center region as disclosed by Yamamoto et al to be half the size of the microlenses located on the outer regions to improved the focused light while increasing the light sensitivity of the image sensor device allowing clear and accurate pixel images to incident on the center of the image sensing area of the chip, (see fig. 4, column 3, lines 21-67).

As to claim 6, Endo et al fail to teach a 20% reduction of microlenses sizes. Yamamoto et al disclose reduced size microlenses.

It would have been obvious for one ordinary skill in the art to modify Endo et al to include reduced microlenses disposed in the chip center as disclosed by Yamamoto et al to be half the size of the microlenses located on the outer regions to improved the focused light while increasing the light sensitivity of the image sensor device allowing clear and accurate pixel images to incident on the center of the image sensing area of the chip, (see fig. 4, column 3, lines 21-67).

Claims 10, 15, 16, 23, and 27 are rejected over Endo in view of Marom et al (6,867,920).

As to claim 10, Endo et al disclose microlenses. Endo et al fail to teach constant microlenses sizes in each group. Marom et al teach constant microlenses sizes in each group.

It would have been obvious for one ordinary skill in the art to modify Endo et al to include constant microlenses sizes in each group to focus incident light onto the center of the sensing area to improve pixel quality and to avoid or minimize crosstalk in adjacent regions, (see fig. 3, column 4, lines 27-67, fig. 5, column 5, lines 15-42).

As to claim 15, Endo et al disclose microlenses. Endo et al fail to teach constant distance. Marom et al teach constant distance in each group relative to each microlenses.

It would have been obvious for one ordinary skill in the art to modify Endo et al to include constant distance relative to each microlenses group to focus incident light onto the center of the sensing area to improve pixel quality and to avoid or minimize crosstalk in adjacent regions, (see fig. 3, column 4, lines 27-67, fig. 5, column 5, lines 15-42).

As to claim 16, Endo et al disclose microlenses, and colored filtered units. Endo et al fail to disclose groups. Marom et al disclose microlenses groups (501/502), (503/522/504), and (505/506).

It would have been obvious for one ordinary skill in the art to modify Endo et al to include microlenses groups (501/502), (503/522/504), and (505/506) with each group having a constant microlenses size as disclosed by Marom et al to focus incident light (533) to the center of the sensing areas of the adjacent groups shifting the adjacent microlenses accordingly improving pixel quality and minimizing crosstalk corresponding to each region of the group microlenses, (see fig. 3, column 4, 27-50, fig. 5, column 5, lines 15-42).

As to claim 23, Endo et al disclose microlenses. Endo et al fail to teach microlenses in plurality of groups. Marom et al teach microlenses in each group.

It would have been obvious for one ordinary skill in the art to modify Endo et al to include microlenses in a plurality of groups with a constant distance to focus incident light onto the center of the sensing area to improve pixel quality and to avoid or minimize crosstalk in adjacent regions, (see fig. 3, column 4, lines 27-67, fig. 5, column 5, lines 15-42).

As to claim 27, Endo et al disclose microlenses. Endo et al fail to teach constant microlenses sizes. Marom et al teach constant microlenses sizes in each group.

It would have been obvious for one ordinary skill in the art to modify Endo et al to include constant microlenses sizes in each group to focus incident light onto the center of the sensing area to improve pixel quality and to avoid or minimize crosstalk in adjacent regions of each group, (see fig. 3, column 4, lines 27-67, fig. 5, column 5, lines 15-42).

Claim 17 rejected under 35 U.S.C. 103(a) as being unpatentable over Endo in view of Marom as applied to claim 17 above, and further in view of Yamamoto.

As to claim 17, the modified Endo et al disclose sensing areas. The modified Endo et al fail to disclose each group. Yamamoto et al disclose each group with sensing areas.

It would have been obvious for one ordinary skill in the art to modify Endo et al to include each group with sensing areas as disclosed by Yamamoto et al to improve and

increase the uniformity of incident light and minimize crosstalk in each group, (see fig. 2, column 2, lines 42-67, column 3, lines 1-20).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Don Williams whose telephone number is 571-272-8538. The examiner can normally be reached on 8:30a.m. to 5:30a.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dave Porta can be reached on 571-272-2444. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Don Williams
Patent Examiner
Art Unit 2878
Ph: 571-272-8538

DAVID PORTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800